

Chapter 11

Summary of Recommended Plan

CHAPTER 11

SUMMARY OF RECOMMENDED PLAN

11.1 INTRODUCTION

This chapter identifies and presents the Comprehensive Wastewater Management Plan's Recommended Plan. The chapter is a culmination of the findings presented in the previous documents prepared as part of this project, the evaluations included in this Report, and the findings of the MEP work related to the Town of Chatham. This Chapter outlines the recommended plan, mitigation measures necessary as part of the implementation, and a proposed schedule to implement the plan. The Chapter also discusses the financial planning efforts, future work, and other institutional considerations necessary for the plan.

The goals of the recommended plan are to achieve the estuarine nitrogen TMDLs for the Town, address other AOCs within Town, and provide an adaptive management approach to implementation such that as the plan is executed it can be adjusted based on the environmental and economical impacts that may result during its implementation.

11.2 IDENTIFICATION OF THE RECOMMENDED PLAN

The recommended plan for Chatham would involve the implementation of an adaptive management approach including the following major components:

- Two-phased implementation of WWTF expansion at the existing WWTF site. Phase I would treat approximately 1.3 mgd on an average annual basis to meet TMDL requirements in Stage Harbor, Pleasant Bay, Sulphur Springs, and Taylor's Pond watershed areas. Phase II would expand this facility to 1.9 mgd on an average annual basis and serve the entire Town of Chatham. WWTF Flows are summarized on Table 9-6.

- Expansion of the existing collection system to match the two Phases of the WWTF expansion with the possibility of sewerage all of the 94 sewersheds identified. Sixty-one (61) of the 94 sewersheds identified would need to be sewerage in order to address the TMDL requirements.
- Further investigation into the freshwater restoration of the upper reaches of Muddy Creek which could provide a quicker remediation of the nitrogen impacts of this waterbody and to Pleasant Bay as a whole.
- Implementation of the coastal embayment water quality monitoring program for TMDL compliance and continued groundwater monitoring at the WWTF site.
- Continued public education on fertilizer use and management of other controllable sources of nitrogen within the Town.
- Continued enforcement of the Town of Chatham Board of Health Nitrogen Loading Regulation in those areas not designated for immediate (next 5 to 10 years) connection to the WWTF as part of addressing the Town's TMDLs.
- Continued implementation of storm water improvements and management.

Each of these components is described below.

A. WWTF Expansion. The following wastewater treatment processes have been identified throughout the development of the CWMP. The following list is a summary of the core technologies that will make up the new WWTF's major components.

Preliminary Treatment:

- Pre-engineered system for screening and grit removal.

Secondary Treatment

- Orbal® process with post anoxic tanks and reaeration constructed in a modular design to allow Phase II expansion as the flow increases.
- Three secondary clarifiers (2 for Phase 1, third for Phase 2).

Filtration

- Continuous backwash sand filters.

Disinfection

- Filtration in the sand infiltration beds. (A UV system has been considered and may be required by MassDEP in the future)

Sludge Processing

- System expansion with 2.0 m Belt Filter Presses.

Odor Control

- Activated Carbon.

Support Facilities

- RAS and WAS pumping (centrifugal pumps).
- Plant water (pumps and hydropneumatic tank).
- Sodium hypochlorite for nocardia control – chemical tank and pumps.
- Sodium hydroxide for alkalinity addition – chemical tank and pumps.
- Methanol –for supplemental carbon.

Other considerations as requested by the Town for flexible future site operations.

- Provide space for a physical/chemical TP removal system, and a possible additional anaerobic zone for TP removal.
- Provide space for RAS processing for the possible consideration of a Cannibal® sludge minimization process.

For a summary of all equipment, see Table 9-7 for Phase I equipment.

B. Collection System. The collection system will be phased over 30 or more years. The first 20 years will include the expansion of the existing collection system to address those areas in Town identified as AOCs in order to achieve the TMDLs. This will include the extension of sewers within 61 sewersheds shown on Figure 9-6, and extension of sewers for the 33 remaining sewersheds over the ten years following the Phase I implementation as shown in Figure 9-1.

The total length of proposed sewer is approximately 110 miles, 88 miles of which are proposed gravity and 18 of proposed low pressure, compared to the existing system of approximately 5 miles of gravity mains. The total number of low pressure grinder pumps is estimated at 1,200. This amount estimates one grinder pump per building/property. There are grinder pump units suitable for multiple buildings; however, these installations can become difficult to manage if buildings are owned by different parties; therefore this plan is based on 1 pump per property.

Of the 1,200 grinder pumps, approximately 530 belong to buildings where a gravity main is installed in the road, but the elevation of the building is lower than the gravity main; therefore a pump is needed to convey the wastewater to the higher elevation in the main. The remaining 670

grinder pumps belong to buildings that have low pressure sewers based on review discussions and the cost analysis with the Town.

A total of 80 pump stations are required for this Town-wide sewer master plan.

Approximately ten (10) easements will be needed to implement the collection system as identified during the preliminary design. These easements are identified in Appendix Q on Sheets 1 through 15 and are highlighted in yellow. Attaining these easements is a critical next step for the Town in order to implement the collection system within these sewersheds.

11.3 PLANNED MITIGATION MEASURES

As part of the EIR process outlined in 301 CMR 11.07, the following mitigation measures were identified. These measures were outlined and identified to limit negative environmental impacts and/or create positive environmental impacts during development and operation of this alternative.

A. Design and Construction Mitigation

1. **General Construction Measures.** During construction, the site shall be secured to prevent unauthorized entry to the construction site, and to protect existing and adjacent facilities and properties. Supplemental lighting, signs, railings, and construction barriers shall be used as necessary to provide safety to employees, construction workers, visitors, and the general public during the construction process in accordance with OSHA and other applicable regulations.

Water used during the construction process, and that generated from runoff on the site, will be controlled by proper site grading, and by providing temporary berms, drains, and other means to prevent soil erosion. These means will also be used to reduce puddling and runoff on the site. Existing and new catch basins will be protected from siltation using hay bales and siltation fence. At no time will the pumping of silt-laden water be allowed in trenches, excavations, surface waters, stream corridors, or wetlands. Pollution controls will also be provided to prevent the contamination of soils, water and the atmosphere from the discharge of noxious, toxic substances, and pollutants produced during the construction process.

Erosion control measures including hay bales, siltation fencing and erosion control fabric will be used to provide sedimentation barriers. Temporary seeding and mulching may also be used to minimize soil erosion and provide soil stabilization on slopes. Diversion trenches may also be used on the uphill side of disturbed areas to divert surface runoff. Land disturbances will be kept to a minimum to reduce impacts and erosion. All erosion and storm water control methods shall be in accordance with the USEPA NPDES General Permit requirements, State of Massachusetts and the Town of Chatham. A storm water pollution prevention plan (SWPPP) will also be required as part of the NPDES General permit.

The site will also be maintained free of waste materials, debris, and trash following each day of work. Waste and other debris will be collected and disposed of off-site periodically. At no time during construction will the dumping of spoil material, waste, trees, brush or other debris be allowed into any stream corridor, any wetland, any surface waters or any unspecified location. The permanent or unspecified alteration of stream flow lines is not allowed during construction.

Construction noise with heavy equipment will be limited to within normal operation hours of 7:00 am to 5:00 pm. Dust controls including the use of street sweepers and/or watering trucks will be used to minimize air-borne dust.

2. **Collection System Construction.** In addition to the measures identified in the general construction section, police details and other traffic controls will be necessary to minimize traffic problems during construction of collection systems. Detours and trucking routes will need to be identified prior to construction and these routes will need to be designed to minimize impacts to surrounding residential areas not accustomed to heavy construction and increased vehicle traffic. Construction of the collection system will have to allow for safe travel of both pedestrians and vehicle traffic.

Collection system extensions are planned in the road layouts to avoid impacts to animal habitats, wetlands, historic areas, or potential archeological sites. Construction in these areas will impact traffic (vehicle, pedestrian, and bicycle) in the roadways during construction. These impacts will be of short duration and construction within Road Right of Ways will not be timed for the summer season to avoid traffic congestion. Construction procedures for traffic control, erosion protection, dust control, noise prevention, and wetland protection will be implemented. Use of

trench boxes, bracing and other shoring methods will be utilized to provide the necessary safety for workers and others at the construction site. Any property, including trees and vegetation, that is damaged during construction is to be repaired or replaced by the contractor. Any collection system components and pump stations to be constructed outside of road right-of-ways will be reviewed with the Massachusetts Historical Commission.

The collection system pump stations need to be located in low-elevation areas to be able to utilize gravity pipes that flow to a low area for collection and subsequent pumping. Wetland regulations and permitting will be followed to minimize impacts to any adjacent wetlands.

Storm water and construction run-off will be managed through the implementation of construction SWPPPs established prior to construction and regulated under USEPA NPDES General Permits for Construction.

Areas requiring sewers located within parts of Town identified as barrier beach will have to be designed and constructed to meet specific state requirements for work within these areas (Executive Order 181), and will have the following stringent requirements for the construction of sewers on a barrier beach:

- a. All infrastructure must be protected from coastal flood hazards.
- b. The sewers cannot promote additional growth on the barrier beach that would not have otherwise been allowed.

Previous discussions held with the Massachusetts Coastal Zone Management (CZM), the agency that upholds Executive Order 181, have identified that the water quality benefits provided by the collection system extensions will greatly outweigh the slight risk that a catastrophic coastal hazard could damage some of the infrastructure. Certainly, collection system extensions will be designed to withstand coastal flood hazards with pump stations that will not be flooded with a 100-year storm and all pipes and equipment suitably protected from wave action.

Chatham passed a sewer regulation at Town Meeting that takes a growth-neutral approach with respect to sewer extension (attached in Appendix N). This regulation was specifically designed to prevent potential growth that might occur as a result of sewer extension.

3. **Wastewater Treatment Facility Site.** In addition to those mitigation measures identified previously, the following measures will be provided at the WWTF site. The greatest mitigation measure is the operation of a new advanced wastewater treatment system designed for nitrogen removal to 3 mg/L total nitrogen, which will result in long-term improved water quality Town-wide. The existing WWTF will remain in operation during the construction of the new facility and all permit requirements will continue to be met to the best of their ability during this construction.

This new wastewater treatment system will help reduce the amount of nitrogen entering the Town of Chatham's coastal embayments in order to achieve the established TMDLs, and will also provide the greatest removal of suspended solids and BOD in the effluent. This system will increase the production of sludge and increase the volume of treated water recharged to the water table. The sludge will be disposed of at an approved off-site facility in accordance with MassDEP guidelines. The increase in treated water recharge has been modeled locally and by USGS to review impacts, all of which have been identified as negligible; however the recharge will be monitored as part of an approved groundwater monitoring plan.

Odor and noise mitigation measures will also be considered as part of the final design to minimize the impacts to adjacent properties during construction and operation.

The following mitigation measures will be observed to avoid or minimize adverse environmental impacts at the existing WWTF site:

- Construction will be kept to a minimum on the northern side of the site (the direction of a possible estimated habitat).
- The majority of the construction will take place on a previously developed parcel.
- Vegetative screens will be employed if it is determined that they are necessary for aesthetic reasons.
- Work will be halted if archaeological resources are uncovered during construction.
- The contractor will be required to thoroughly clean up the site before the contract is considered complete.
- Expert agencies will be contacted when a resource may be impacted.

- Proper handling and storage of possible contaminants and hazardous substances will be required of the contractor.
- Access roads will be dampened to minimize construction dust.
- Debris will not be burned as a means of disposal.
- No structures will be placed near airfield runways, approaches, and flight paths.
- No construction work will be performed during evening, holiday, or weekend hours.
- A resident project representative will be employed to ensure that the project area is kept clean and that mitigation measures are met.

11.4 PLANNED IMPLEMENTATION TIMING

A critical piece to the facilities planning process is the implementation timing of the recommended plan. The recommended plan is a comprehensive strategy for wastewater and nitrogen management in Chatham for a 20-year period; and with a perspective on the ultimate build-out condition for the Town. The 20-year period is 2010 to 2030, which is the estimated time period for implementation of the wastewater facilities to meet the immediate wastewater needs in Town. The recommended plan also includes the strategy to extend wastewater collection and treatment facilities to the rest of the Town within approximately 10 years of the completion of Phase 1 (from 2030 to 2040).

The Town plans to proceed rapidly with design and construction of new facilities following the completion of the CWMP. Figure 11-1 provides a proposed schedule depicting the completion of the Final CWMP/EIR and milestones for securing State Revolving Fund (SRF) low-interest loans; design of the first portion of the recommended plan; and expansion and upgrade of the WWTF.

Several alternative timelines were considered for the extension of the future collection system. The Summer Residents Advisory Committee, a Town advocacy group comprised of residents that own summer homes in Chatham, but maintain year-round residency outside of Chatham (and therefore cannot vote at Chatham Town Meetings), expressed the view that they would like to see the entire Town served by a modern wastewater collection and treatment system in a period of 8 to 10 years to deal conclusively with these wastewater and nitrogen problems. Subsequent evaluations by Stearns & Wheler and the Town's Wastewater Planning Technical Advisory Group, indicated that the implementation of sewers at this pace would cause major

disruptions in Town to traffic, business, etc. during the 8- to 10-year period and could damage the summer-time vacation economy. It would also place a strain on the planning of other capital projects in the Town. After review with the Citizens' Advisory Committee and Board of Selectmen, general consensus indicated that a 20-year implementation was the most practical and feasible for the treatment plant upgrade and sewer expansion to the portions of Town with critical wastewater nitrogen management needs (i.e., to the areas affected by the nitrogen TMDLs). This 20-year period would be called the Phase 1 implementation and would be followed by a 10-year Phase 2 implementation to further expand the treatment facility and extend the sewers to the remaining portions of Town.

Figure 11-2 provides a preliminary schedule of how wastewater treatment and collection facilities might be implemented over this 30 year period.

It is noted that the completion of the collection system preliminary design and master plan provides much flexibility on how the collection system is implemented. The flexibility of this plan will be used in an adaptive management manner to meet the nitrogen TMDLs, meet other Town wastewater priorities, and take advantage of other priorities (redevelopment, road paving, sidewalk reconstruction, etc.) to efficiently install the sewers.

11.5 FINANCIAL PLAN

The Town's Technical Advisory Group has been actively evaluating mechanisms on how a collection system expansion and treatment facility upgrade would be financed and implemented in Town. Several scenarios were presented by the Town Manager and Town Finance Director to the Board of Selectmen to outline the financial options, and to develop a capital plan that would allow a sewer expansion and treatment facility upgrade to proceed without jeopardizing other capital projects in Town and with a fair distribution of costs to the Town's people.

The Town is expected to seek funding from both the USDA Rural Development Program and the State Revolving Fund (SRF) to fund part of the WWTF construction project, and possibly funding for future sewer projects. The Town has developed several approaches for funding and debt repayment.

The Town of Chatham adopted a Capital Facilities Plan in Fiscal Year 2003 to address the issue of its aging infrastructure. A portion of this replacement plan is dedicated to the Wastewater Facility Expansion.

A financial plan was developed that was aimed at funding the Capital Facilities Plan without increasing the tax rate. This plan includes an infrastructure replacement phase-in schedule of 20 year bond issues (30 years for sewer expansion). To accomplish this goal, the Town stabilized its debt at \$4.7 million. A policy was instituted to insure that as the debt is paid off, and therefore reduced each year, the Town would continue to be able to fund the \$4.7 million. This policy enables the Town to use the “debt drop-off” to achieve its goal of funding its infrastructure replacement without a tax rate increase.

The Wastewater Treatment facility alone is a \$42 million project that will be funded partly through debt drop-off. The remaining funds will come from the tax rate and other sources as shown below. The Town is proposing the following approach for financing the project:

- Sewer user rates will cover 100% of the O&M and ultimately 25% of the debt (including the collection system);
- A proposed real estate transfer tax would cover 25% of the debt; otherwise this portion of the project costs will be borne by the taxpayer;
- Debt drop-off and some combination of betterments and the tax rate would cover the remaining 50% of the debt.

The Town’s current sewer user rate is not anticipated to increase from those provided in Table 8-1. Seventy-five percent of the current rate goes towards operations and maintenance costs for the existing WWTF. This is expected to continue following the completion of this project.

The Town currently does not have a Debt Service Reserve. The Town does plan on setting up a Short-Lived Asset Reserve, as part of a 5-year capital plan once construction starts. A detailed schedule would be developed following final design when the upgrade and expansion is identified in detail.

Table 11-1 provides a summary of the plan costs.

11.6 INSTITUTIONAL CONSIDERATIONS

The following section identifies several primary institutional considerations related to plan implementation:

- permitting
- prioritization
- proprietary equipment
- ownership, and operation and maintenance considerations
- easements
- monitoring programs

The following text discusses these considerations.

A. **Permit Requirements.** The following is a list of permits and approvals that are, or are likely, to be required during implementation of the recommended plan:

- Massachusetts EOE A approval of the Comprehensive Wastewater Management Plan and Final Environmental Impact Report.
- Cape Cod Commission approval of the Final Comprehensive Wastewater Management Plan and Final Environmental Impact Report as part of the Development of Regional Impact (DRI) approval process.
- Massachusetts Department of Environmental Protection sewer extension permitting (BRP WP 13, 17 or 18).
- Massachusetts Department of Environmental Protection Groundwater Discharge Permit (BRP WP 06) for sanitary sewage discharges in excess of 150,000 gpd or providing advanced treatment of sewage.
- Massachusetts Department of Environmental Protection Notice of Intent (WPA Form 3) for work within the 100 foot buffer to a wetland, per the wetlands regulations 310 CMR 10.00.
- Massachusetts Department of Environmental Protection Air Quality Permits, BWP AQ 04 - Asbestos Removal Notification that may be required for Asbestos Pipe removal and BWP AQ 06 Construction/Demolition Notification.

- Massachusetts Department of Environmental Protection Emergency Engine and Emergency Turbine Compliance. The program applies to all new emergency or standby engines with a rated power output equal to or greater than greater than 37 kW or emergency turbine with a rated power output less than one megawatt constructed, substantially reconstructed, or altered after March 23, 2006.
- Massachusetts Department of Environmental Protection Air Quality Permit BWP AQ 14, 15, 16, 17 Operating Permits. These are mandated for major sources of air pollution by the Clean Air Act Amendments of 1990. Massachusetts has incorporated this program in 310 CMR 7.00 Appendix C of its Air Pollution Control Regulations. In some cases, emissions from WWTFs or odor control systems trigger this requirement.
- Commonwealth of Massachusetts Department of Public Works Permit for work with State Highway Layouts. These will be required for any work along Route 28 required as part of the recommended plan.
- Town of Chatham building permits for construction of structures as part of the recommended plan.
- Town of Chatham Water and Sewer Department sewer connection permitting.
- Town of Chatham Conservation Commission permits for work within 100-foot buffer of a wetland.

B. Design and Construction Issues. As the Town moves forward in implementing the recommended plan, several issues will need to be resolved during design and construction:

- Proprietary equipment / sole sourcing of equipment.
- Standardization of equipment (mainly pump station and grinder pump units).
- Grinder pump unit ownership.
- Prioritization of sewersheds.

During the evaluation of technologies and as part of the preliminary design, interest by the TAG on some specific technologies has been expressed. The Town understands that the Commonwealth of Massachusetts requires projects be open to as many contractors and equipment suppliers/manufactures as possible to make the process competitive and encourage fair pricing. The Commonwealth also encourages performance based specifications in those areas where a particular technology or piece of equipment is sought, however the Massachusetts

General Laws (M.G.L.s) do allow for selection of a specific piece of technology if it is deemed in the best interest of the project and endorsed and documented by the Town.

The recommended plan calls for an Orbal® advanced secondary process which is an oxidation ditch type process. Construction of the concrete tanks will be competitively bid. However, there may be components of the equipment that are provided by the Orbal® process manufacturer in order for them to provide performance guarantees on their process. To the fullest extent possible, components of the Orbal® process will be specified naming three manufacturers or equal, including: pipes, valves, gates, pumps, motors, etc.

The Town may also wish to standardize around a particular piece of equipment, for example grinder pump units or pumping station equipment, in order to minimize storage of spare parts for several different manufacturers and minimize operational and maintenance issues and training associated with maintaining different manufacturers equipment for the same application. Although grinder pumps are the most common collection system component where this might be applied, the Town may have a desire to standardize around a valve, pump or other equipment manufacturer for other collection system and WWTF components.

In the case of grinder pump units, the Town needs to make decisions prior to collection system design on ownership issues associated with these units. The Town may elect to:

- Purchase, install, own, operate and maintain the equipment.
- Purchase equipment and property owners install, own operate and maintain.
- Let the property owner purchase and install, and the town operate and maintain.
- Let the property owner maintain complete ownership and maintenance requirements.

This issue will be addressed by the Town during final design and implementation.

Lastly, the recommended plan provides guidance and flexibility on which areas should be addressed in order to achieve the TMDLs, however, it will be the ultimate decision of the Town to identify which areas will be addressed first and prioritize the remaining areas such that the ultimate 20 year plan (Phase 1) can be implemented efficiently.

C. **Embayment Monitoring.** The overriding need to extend sewers is to remediate the current nitrogen loading to coastal estuaries as identified by the nitrogen TMDLs. MassDEP will require embayment monitoring of water quality, eel grass coverage, and benthic habitat to verify that the sewer extension and nitrogen remediation efforts are effective.

Working with MassDEP, CCC, and SMAST, the Pleasant Bay Alliance has taken the lead in defining the scope and content of a long-term embayment monitoring program to meet nitrogen TMDLs. They have recognized the following key items about such a program:

- The ultimate goal is to restore the marine habitat to the levels that are the basis of the TMDLs.
- The attainment of the threshold nitrogen concentrations at the estuary sentinel stations are an indicator of the condition that habitat can repair itself.
- The implementation of Phase I (to remediate watershed nitrogen loadings as the method to meet the TMDLs) will require a period of 20 years. The positive response of the water quality and benthic habitat will require several more years, given the groundwater travel time from the watersheds to the estuaries, and the release and flushing of the stored benthic nitrogen loads.
- Some portions of the habitat such as regrowth of eel grass may not be possible due to other factors such as past deposition of organic solids, on-going boat traffic, etc.
- Once the water quality returns to a level near the threshold concentration, active eel grass restoration efforts may be needed.
- The embayment monitoring will be a long-term effort and will need to be a team effort between the communities within the embayment watersheds and MassDEP.

Working with MassDEP, CCC, and SMAST, the Pleasant Bay Alliance is currently working on a pilot project to develop an embayment monitoring program for that water body, with the expectation that its primary monitoring criteria, parameters, and overall structure can be used by the communities at other embayment watersheds. The Town of Chatham, represented by Dr. Robert Duncanson, is an active member in this group and will continue to work for the development and implementation of the embayment monitoring program for Pleasant Bay; as well as its application to the Stage Harbor, Sulfur Springs/Bucks Creek, and Taylor Pond/Mill Creek systems.

D. Groundwater Monitoring. The current groundwater monitoring program for the treated water recharge at the Chatham WWTF is based on agreements between the Town and MassDEP as guided by the Administrative Consent Order on the WWTF. The current program includes the following components:

- Water level is monitored at approximately 50 monitoring wells (some are screened in the upper aquifer and some are screened in the lower aquifer) as indicated in Appendix S. These levels are monitored three times per year (typically in April, August, and December).
- Water quality is monitored (at the same time periods) from eight of the wells. Two of the wells are directly downgradient of the treated water recharge to measure any elevated nitrogen or conductivity level, and the remaining six wells are outside of the groundwater affected by the recharge (plume area). The water quality monitoring typically includes field parameters of specific conductance, temperature, and pH; nitrate and nitrite nitrogen; total Kjeldahl nitrogen; and dissolved sodium. In FY 2007, several samples were analyzed for total organic carbon.

This monitoring program is expected to be incorporated into a new groundwater discharge permit after approval of the CWMP. The permit and monitoring program will receive public review at that time. As treated water flows increase, the water level monitoring network may need to be expanded to observe any changes in groundwater elevations as indicated by recent groundwater modeling (Appendix E). These changes are expected to occur over a long period.

Due to the long time period that will occur as recharge flows increase, groundwater level monitoring at the 50 wells should be changed to an annual basis for 2 out of every 3 years, and then seasonally (3 times per year) every third year. Groundwater quality monitoring for the current monitoring parameters should continue 3 times per year.

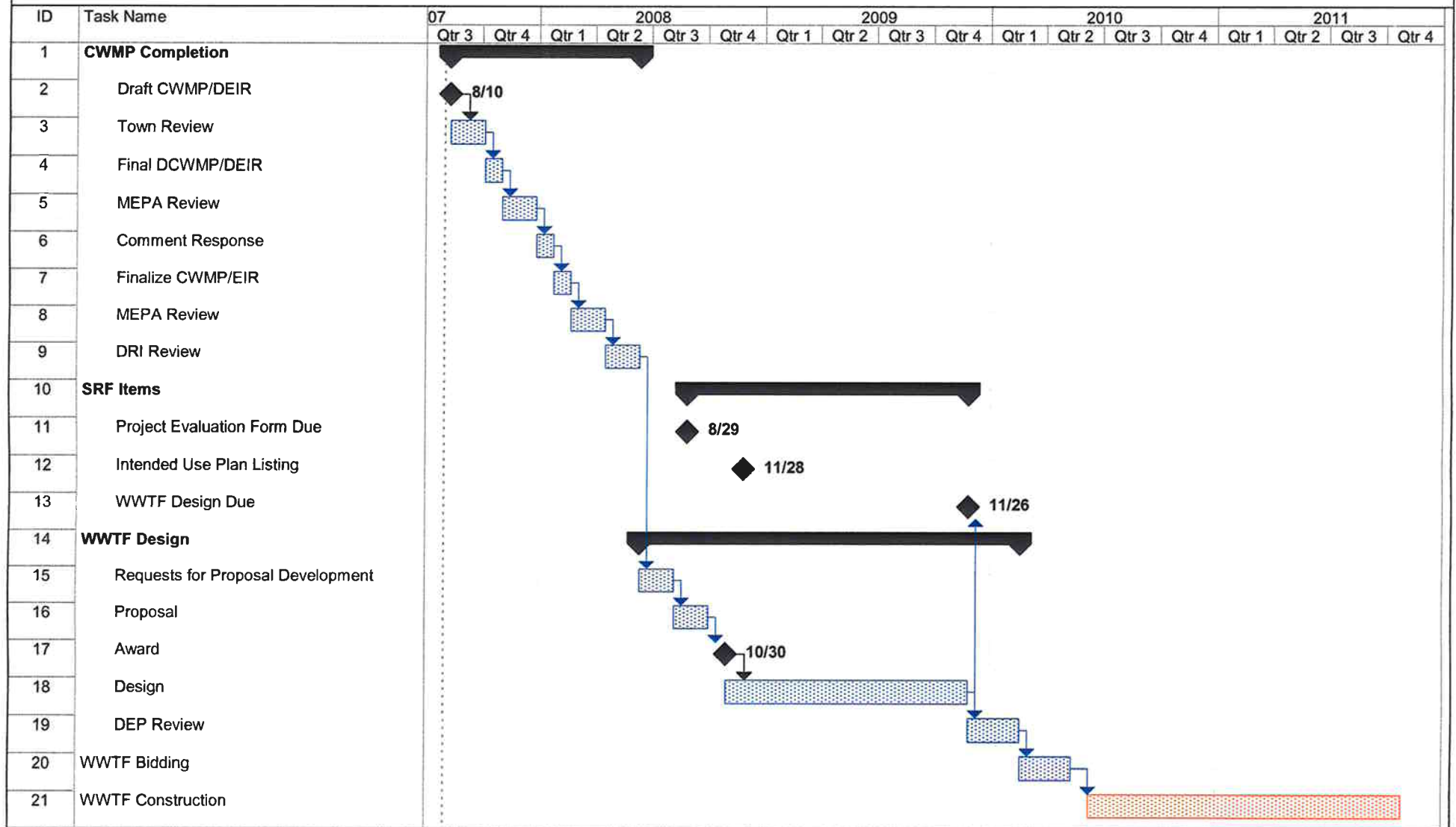
Tables

TABLE 11-1**RECOMMENDED PLAN COST SUMMARY**

DESCRIPTION	PHASE 1	PHASE 2 (INCLUDES PHASE 1 COSTS)
Collection System Construction Cost	\$ 110,000,000	\$ 170,000,000
Collection System Contingency (25%)	\$ 28,000,000	\$ 42,000,000
Collection System Design Engineering	\$ 1,000,000	\$ 17,000,000
Fiscal, Legal and Construction Engineering (15%)	\$ 17,000,000	\$ 25,000,000
Collection System Design/Construction Subtotal	\$ 170,000,000	\$ 250,000,000
Collection System Operation & Maintenance Costs (annual)	\$ 900,000	\$ 1,400,000
Collection System Operation & Maintenance Costs (present value²)	\$ 13,000,000	\$ 20,000,000
Collection System Total	\$ 180,000,000	\$ 270,000,000
WWTF Construction Costs ⁽¹⁾	\$ 30,000,000	\$ 39,000,000
WWTF Contingency (20%)	\$ 6,000,000	\$ 7,800,000
WWTF Design Engineering	\$ 1,100,000	\$ 1,800,000
Fiscal, Legal and Construction Engineering (15%)	\$ 4,500,000	\$ 5,900,000
WWTF Design/Construction Subtotal	\$ 42,000,000	\$ 55,000,000
WWTF Operation & Maintenance Costs (annual)	\$ 1,000,000	\$ 1,200,000
WWTF Operation & Maintenance Costs (present value²)	\$ 15,000,000	\$ 18,000,000
WWTF TOTAL	\$ 57,000,000	\$ 73,000,000
TOTAL	\$ 240,000,000	\$ 340,000,000
Note: 1. Treated Water Recharge for five new beds included in Phase 2 Costs Only 2. Costs are based on June 2007 and an ENR of 7942 3. Costs rounded to two significant figures		

Figures

TOWN OF CHATHAM, MASSACHUSETTS
COMPREHENSIVE WASTEWATER MANAGEMENT PLAN
PROPOSED CWMP AND WWTF
IMPLEMENTATION SCHEDULE
FIGURE 11-1



Project: Figure 11-1
Date: Tue 7/31/07

Task



Milestone



External Tasks



Split



Summary



External Milestone



Progress



Project Summary



Deadline



TOWN OF CHATHAM, MA
COMPREHENSIVE WASTEWATER MANAGEMENT PLANNING
PROPOSED PHASE I AND PHASE II
IMPLEMENTATION SCHEDULE
FIGURE 11-2

